TRANSMITTAL OF APPEAL BRIEF	Docket No. 27754/X254A

In re Application of: Stephen Temple et al.

Application No.	Filing Date	Examiner	Group Art Unit
09/754,486-Conf. #4903	January 3, 2001	S. Staicovici	1732

Invention: METHOD OF AND APPARATUS FOR FORMING NOZZLES

TO THE COMMISSIONER OF PATENTS:

Transmitted herewith is the Appeal Brief in this application, with respect to the Notice of Appeal filed: March 9, 2005 .

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Bryan J. Lempia

Dated: June 9, 2005

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Dated: June 9, 2005 Signature: Bryan J. Lempia (Bryan J. Lempia)

Docket No.: 27754/X254A
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Stephen Temple et al.

Application No.: 09/754,486 Confirmation No.: 4903

Filed: January 3, 2001 Art Unit: 1732

For: METHOD OF AND APPARATUS FOR FORMING NOZZLES Examiner: S. Staicovici

APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Appeal Brief is submitted in furtherance of the Notice of Appeal, filed in this case on March 7, 2005 and *received* by the United States Patent and Trademark Office on March 9, 2005. A request for a one-month extension of time and the appropriate fee accompany this paper. Thus, this Appeal Brief is timely filed on June 9, 2005 within three months from the date of the appeal.

This brief is transmitted in triplicate. The brief and extension fees required under §41.20(b)(2) and §1.17(a) are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief contains items under the following headings as required by 37 C.F.R. §41.37 and M.P.E.P. §1206:

I. Real Party In Interest
II Related Appeals and Interferences
III. Status of Claims
IV. Status of Amendments

I. REAL PARTY IN INTEREST

The real party in interest for this appeal is XAAR TECHNOLOGY LIMITED, assignment recorded on August 4, 1998 at Reel 9363, Frame 0144.

II. RELATED APPEALS, INTERFERENCES, AND JUDICIAL PROCEEDINGS

There are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. History

The application was originally filed with a preliminary amendment canceling claims 1-6, 11, 26, and 27, amending claims 7-12, 14, 15, 16, 18, 20, 21, and 28-31, and adding new claims 32-35. Therefore, the application was originally filed with 26 claims. Two additional claims were added and several canceled during prosecution.

B. Current Status of Claims

1. Claims canceled: 1-8, 10-22, 26-30, 32, and 33.

2. Claims withdrawn from consideration but not canceled: none.

3. Claims pending: 9, 23-25, 31, and 34-37.

4. Claims allowed: none (34, 36, and 37 are considered allowable, but for dependency on rejected base claim and/or informal rejections under 37 C.F.R. §112).

5. Claims rejected: 9, 23-25, 31, and 34-37.

C. Claims On Appeal

The claims on appeal are claims 9, 23-25, 31, and 34-37.

IV. STATUS OF AMENDMENTS

A new, proposed amendment is filed by the appellants *with this Appeal Brief.* The new amendment has not been entered. The proposed amendment merely would place the independent claims in better form for appeal and would remove issues from appeal, if entered. Entry and consideration of the accompanying proposed amendment are respectfully solicited.

The most recent prior amendment was filed by the appellants on October 15, 2004. The examiner has entered and considered that amendment, which resulted in the third non-final action dated January 12, 2005 (the Action), from which this appeal is taken. This most recent action is subsequent to a first non-final action of February 4, 2003, a final action of July 21, 2003, and a second non-final action of June 15, 2004 (after filing a Request for Continued Examination).

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present application is directed to a method and system for forming nozzles in a nozzle plate for ink jet printheads. Claim 9 defines the invention as a method of forming a nozzle in a nozzle plate 20, p. 7, line 7, for an ink jet printhead. The nozzle plate has a nozzle inlet and a nozzle outlet in respective opposite faces of the plate. The method is comprised of several steps including directing a high energy beam 30, p. 7, line 9, having a first axis 125, p. 12, line 17, extending in a first direction towards the nozzle plate, introducing divergence 40, p. 7, line 15, into the beam, thereafter directing the beam at a single aperture 72, p. 7, line 28, of a mask 70, p. 8, line 28, to thereby shape the beam. The beam is then placed through a beam converging means 60, p. 7, line 27; 80, p. 8, line 10, and subsequently directed at the substrate so that the beam first impinges upon the face 22, p. 8, line 11, of the nozzle plate in which the nozzle outlet would be formed to thereby form a nozzle. The nozzle outlet is said to be conjugate through the beam converging means with the single aperture. The method is also comprised of introducing divergence into the beam by splitting the beam into a number of sub-beams 50, p. 7, line 16, each sub-beam having

divergence. The origin of divergence of each sub-beam lies apart from the point 52, p. 7, line 16, at which the respective sub-beam is created by splitting. The sub-beams are thereafter passed through further beam converging means prior to recombining and directing the sub-beams through the single aperture of the mask. Dimensions of a section of the recombined beam 56, p. 7, line 27, directly prior to impinging a plane of the mask are substantially equal to dimensions of the single aperture of the mask.

The method of claim 9 is also comprised of directing the high energy beam at a first planar reflecting surface 12, p. 12, line 15, lying at an angle to the first direction. The first surface is arranged so as to reflect the beam toward at least two additional beam reflecting surfaces 122, 123, p. 12, lines 15-16, that are arranged to both invert the beam and direct the beam along an axis colinear with the first axis extending in the first direction. The first planar reflecting surface and the at least two additional beam reflecting surfaces are fixed relative to one another, thereby forming an assembly 120, p. 12, line 15. The assembly is rotated about the first axis and the beam impinges thereafter on the nozzle plate to form the nozzle. The formed nozzle inlet is larger in diameter than the formed nozzle outlet.

Claim 23 defines the invention as a method of forming a nozzle in a nozzle plate 20 for an ink jet printhead. The nozzle is said to have a nozzle inlet and a nozzle outlet in respective opposite faces of the plate. The method is comprised of a number of steps including directing a high energy beam 30 having a first axis 15 extending in a first direction toward the nozzle plate and directing the beam at a first reflecting surface 121 lying at an angle to the first direction. The first reflecting surface is arranged so as to reflect the beam towards a second reflecting surface 122 and a third reflecting 123 surface arranged to both invert the beam and to direct the beam along an axis colinear with the first axis extending in the first direction. The first, second, and third surfaces are fixably located relative to one another to form an assembly 120. The assembly is rotated about the first axis and the beam is thereafter directed at an first impinges on a face 22 of the nozzle plate in which the nozzle outlet would be formed. The nozzle is formed with a nozzle inlet larger in diameter than the nozzle outlet.

Claim 31 defines the invention as a system for forming a nozzle in a nozzle plate of an ink jet printhead. The system is said to comprise a nozzle plate substrate 20, an

assembly 120, and a source of a high energy beam 30 having a first axis 125 extending in a first direction. The assembly is said to comprise a first reflecting surface 121 lying at an angle to the first direction, a second reflecting surface 122, and a third reflecting surface 123. The first, second, and third reflecting surfaces are fixedly located relative to one another such that the high energy beam is reflected by the first reflecting surface towards the second reflecting surface and the third reflecting surface in order to both invert the beam and direct the beam along a second axis colinear with the first axis extending in the first direction. The assembly 120 is rotatable about the first axis and the nozzle plate substrate is partly disposed within a path defined by the second axis and arranged so that the beam is directed at and first impinges on a face 22 of the nozzle plate substrate in which a nozzle outlet would be formed. The nozzle outlet is smaller in size than a nozzle inlet formed in an opposite face of the nozzle plate substrate.

Claim 36 defines the invention as a method of forming a nozzle in a nozzle plate 20 for an ink jet printhead. The nozzle is said to have a nozzle inlet and a nozzle outlet in respective opposite faces of the nozzle plate. The method comprises a number of steps including directing a high energy beam 30 having a first axis 125 extending in a first direction toward the nozzle plate, introducing divergence 40 into the beam, and thereafter directing the beam at a single aperture 72 of a mask 70 to thereby shape the beam. The beam is then passed through a beam converging means 60, 80 and subsequently directed at the substrate so that the beam first impinges on the face 22 of the nozzle plate in which the nozzle outlet would be formed in order to form a nozzle. The nozzle outlet is conjugate through the beam converging means with the single aperture. The method is also said to comprise introducing divergence 40 into the beam comprising splitting the beam into a number of sub-beams 50 , each sub-beam having divergence. The origin 40 of divergence of each sub-beam lies apart from the point 52 at which the respective sub-beam is created by splitting. The sub-beams are then passed through further beam converging means 60, 80 prior to recombining and directing the sub-beams through the single aperture of the mask. Dimensions of a section of the recombined beam 56 directly prior to impinging on a plane of the mask 70 are substantially equal to dimensions of the single aperture of the mask. The method is also said to comprise directing the high energy beam at a first planar reflecting surface 121 lying at an angle to the first direction. The first surface is arranged so as to

reflect the beam toward a second beam reflecting surface 122 and a third beam reflecting surface 123 arranged to both invert the beam and direct the beam along an axis colinear with the first axis extending in a first direction. The first planar reflecting surface and the second and third beam reflecting surfaces are fixed relative to one another to form an assembly 120. The assembly is rotated about the first axis and then the beam impinges on the nozzle plate to form a nozzle wherein the formed nozzle inlet is larger in diameter than the nozzle outlet. The method is also said to comprise initially holding the power of the high energy beam low and increasing the power p. 11, lines 1-17, with increasing depth of the nozzle formed in the nozzle plate.

VI. GROUNDS OF OBJECTION TO BE REVIEWED ON APPEAL

A. Claims 9, 34, and 35 are said to fail to comply with the written description requirement of 35 U.S.C. §112, first paragraph.

B. Claims 9, 23-25, and 34-37 are said to be indefinite under 35 U.S.C. §112, second paragraph.

C. Claims 9, 23, 24, and 31 are rejected under 35 U.S.C. §103(a) as obvious over Nishiwaki et al., U.S. Patent No. 5,263,250 (Nishiwaki) in view of both Shei et al., U.S. Patent No. 5,569,238 (Shei) and GB 2 262 253 (Turner).

D. Claims 9, 23, 24, and 31 are alternately rejected as obvious over Nishiwaki in view of only Turner.

E. Claim 25 is rejected as obvious based on two different reference combinations including over Nishiwaki in view of Shei and Turner, and further in view of Daly, U.S. Patent No. 4,316,074 (Daly), and alternately over Nishiwaki in view of only Turner and Daly.

F. Claim 35 is rejected as obvious based on two different reference combinations including over Nishiwaki in view of Shei and Turner, and further in view of Hizny, U.S. Patent No. 5,048,938 (Hizny), and alternately over Nishiwaki in view of only Turner and Hizny.

VII. ARGUMENT

A. Rejection of Claims 9, 34, and 35 Under 35 U.S.C. §112, first paragraph, Should Be Withdrawn

Claims 34 and 35 depend from independent claim 9. Thus, we address only independent claim 9 with this rejection, as the alleged offending language is found in claim 9.

Claim 9 is rejected because it recites a planar reflecting surface and *at least two additional* beam reflecting surfaces for inverting and directing the beam along an axis that is colinear with the beam first axis. The examiner notes Figures 5a and page 12, line 12 through page 13, line 25, of the specification in stating that inversion and directing of the laser beam can occur **only** when reflecting the laser beam off three reflecting surfaces. The appellants respectfully disagree.

Instead, the written description and drawings illustrate one example of an arrangement using three reflecting surfaces that can invert and direct the beam as claimed. Those having ordinary skill in the art will readily and easily recognize that other reflecting surface arrangements could be utilized to achieve the recited beam characteristics. As is well known, it is not the appellants' duty to disclose every possible structure, component arrangement, or device capable of achieving the recited beam characteristics. The appellants need only disclose the best mode known at the time of the invention for achieving same. Component arrangements described in the specification for the recited beam inversion and beam directing limitations in claim 9 are described in such a way so as to reasonably convey to one of ordinary skill in the art that the appellants had possession of the claimed invention.

As an example, one of ordinary skill in the art would easily recognize that, if the disclosed three reflecting surfaces can invert and direct a beam as claimed, then 6, 9, or 12 reflecting surfaces can be arranged to achieve the same claimed beam characteristics. One having ordinary skill in the art could readily determine, through simple experimentation and testing, whether a particular reflecting surface configuration would or would not produce the beam inversion and directing characteristics recited in claim 9.

The examiner states at pages 2 and 3 of the Action that "inversion of the beam could not have occurred when using *four* (emphasis added) reflecting surfaces." Perhaps under the current state of technology this may be true. However, one cannot be certain. For example, a competitor may conceive of some type of device using a dummy fourth reflecting surface, avoid the language of a claim reciting three and only three reflecting surfaces, and yet produce the desired beam characteristics. If a competitor uses a device having any number of reflecting surfaces that does not produce the desired beam characteristics, it would not fall within the scope of the claim.

Claim 9 as presently written satisfies the written description requirement of §112, first paragraph. The invention as recited in claim 9 is sufficiently disclosed in the written description so that those having ordinary skill in the relevant art will readily recognize that the appellants did in fact have possession of the invention of claim 9 at the time of filing the application. The claim covers a device using three or more reflecting surfaces arranged in such a way so as to produce an inverted beam directed in a particular direction.

The rejection should be withdrawn as improper. Claims 9, 34, and 35 meet the written description requirement of 35 U.S.C. §112, first paragraph.

B. Claims 9, 23-25, and 34-37 are Definite Within the Meaning of 35 U.S.C. §112, Second Paragraph

Independent claims 9, 23, 31, and 36 have been amended in the accompanying proposed amendment. Claims 9, 23, and 36 have been amended to add antecedent basis for the noted "first direction" and "first axis" in each of these claims. The rejection of these claims based on §112, second paragraph, is believed to be overcome in view of the amendments in the accompanying paper. Claim 31 has been similarly amended, though it was not rejected on this basis. In view of the amended language and upon entry of the paper, this rejection of claims 9, 23, and 36 should be withdrawn.

Dependent claims 24, 25, 34, 35 and 37 depend from one of the amended independent claims and are rendered clear in view of the same amendments. The rejection as to these dependent claims should also be withdrawn. Entering the accompanying amendment

removes this issue from appeal and places these claims in better form for appeal. If the accompanying amendment is not entered, the appellants reserve the right to submit the identical claim amendments after resolution of the other issues on appeal.

C. The Rejection of Claims 9, 23, 24, and 31 Under §103(a) Based on Nishiwaki, Shei, and Turner Should be Withdrawn

Claim 24 depends directly from independent claim 23 and, thus, is considered non-obvious for the same reasons addressed below with respect to claim 23. Claims 9, 23, and 31 have been rejected over a combination of Nishiwaki, Shei, and Turner. The rejection is improper for a number of reasons, each addressed separately below.

1. No Motivation or Suggestion to Combine the References in the Manner Applied

The examiner at page 4 of the Action admits that Nishiwaki fails to teach or suggest directing a laser beam to a first reflecting surface and then to at least two additional beam reflecting surfaces that are rotating as in an assembly so as to invert the beam in a colinear direction. The examiner alleges that Shei teaches all of these limitations. For the sake of argument only, we will not dispute this allegation here. In support of the combination of these two references, the examiner states that

> it would have been obvious for one of ordinary skill in the art to have provided an optical homogenizer system including a first, second, and third reflecting means that rotate as taught by Shei *et al.* ('238) in the process of Nishiwaki *et al.* ('250) because, Shei *et al.* ('238) specifically teach that such a homogenizer reshapes and homogenizes the beam in a circular fashion, hence improving the quality of the resulting nozzles.

The examiner has failed to point to or identify a sufficient motivation or suggestion to combine the reference teachings. Instead, the examiner simply has stated a convenient conclusion based on the allegation that all of the claim limitations are taught by one or the other of the references. The examiner has failed to point to anything in either Shei or Nishiwaki that teaches or suggests the combination. The examiner has also failed to point to anything else *within the prior art* providing such a suggestion or motivation.

Instead, the examiner has merely stated that it would have be obvious because Shei specifically teaches a beam reshaper and homogenizer which would hence improve quality of resulting nozzles in a nozzle plate. However, the general desire to improve nozzle quality is not a sufficient motivation or suggestion to combine reference teachings and the examiner has pointed to nothing else within either of the references for such teaching. The rejection is a classic example of hindsight reconstruction, using the appellant's claims as a template, and thus for the suggestion to combine the teachings of Nishiwaki and Shei.

As is well known, a proper *prima facie* case of obviousness based on a combination of two or more references requires that 1) the reference combination teach or suggest all of the claim limitations, 2) there must a reasonable expectation of success in making the combination, and 3) there must be a motivation or suggestion *found within the reference teachings or the well known prior art* to combine the reference teachings in the manner that the references are combined and applied. The examiner has provided no such motivation or suggestion found within Nishiwaki or Shei or any other prior art. Therefore, the obviousness rejection based on this combination must be withdrawn for at least this reason.

The examiner next admits that the combination of Nishiwaki and Shei further fails to teach forming a reverse tapered hole as is generally recited in independent claims 9, 23, and 31. Each of these claims recites that the beam is directed at the nozzle substrate such that the beam first impinges on the face of the nozzle plate in which the nozzle outlet is formed and that, because of the taper, the nozzle inlet is larger in diameter than the nozzle outlet. The examiner alleges that Turner teaches a laser drilling process including a rotating laser beam that ultimately produces a reversed tapered hole. The examiner notes that because the beam in the combination of Nishiwaki and Shei is rotated, and because the Turner reference laser beam is rotating, the combination of Turner with these other two references would have been obvious. The reasons stated by the examiner is that

> it would have been obvious for one of ordinary skill in the art, in view of the teachings of GB 2 262 253 A, that upon rotation of the laser beam assembly as taught by GB 2 262 253 A in the process of Nishiwaki *et al.* ('250) in view of Shei *et al.* ('238) to have obtained a reversed tapered hole, because GB 2 262 253 A specifically teaches that rotation of the laser beam forms a

> reverse tapered hole, whereas Nishiwaki *et al. ('250)* in view of Shei *et al.* ('238) teach rotating of the optical assembly and hence, rotating the laser beam.

What the examiner appears to be saying is merely that it would have been obvious to combine Turner with the combination of Nishiwaki and Shei *merely because both have a rotating laser beam*. This amounts to nothing more than a conclusory statement. Again, the examiner has failed to point to or identify a sufficient motivation or suggestion found within the prior art references themselves or with other known prior art that would lead one to modify the already improper combination of Nishiwaki and Shei further in view of the teachings of Turner. Again, instead of looking to the prior art for the motivation to combine reference teachings, the examiner has looked backward using hindsight reconstruction from the appellant's claims.

The rejection of claims 9, 23, and 31, and thus also dependent claims 24, must be withdrawn. The examiner has failed to put forth a prima facie case of obviousness based on this reference combination.

2. Reference Combination Destroys Specific Teachings of Nishiwaki

Independent claims 9, 23, and 31 each recite formation of a nozzle in a nozzle plate. Nishiwaki teaches a method specifically discloses *and claims* a method of manufacturing a nozzle plate specifically and simultaneously forming a plurality of nozzles at one time and/or a plurality of beams that will be focused on an object to form the plurality of nozzles. The Nishiwaki abstract states an intent to form a plurality of nozzles and that as "a result, a nozzle plate of an inkjet printerhead can be ***accurately and quickly manufactured***." Each independent claim recites plural nozzles formed or plural beams formed to create plural nozzles. These specific and intended purposes of Nishiwaki cannot be ignored.

Shei teaches an energy delivery system that produces only a single beam for use in vision correction surgery. Turner discloses laser drilling of reverse tapered holes in an aircraft wing wherein only a single hole is produced at one time. Ignoring for the moment that both Turner and Shei are from completely unrelated, non-analogous fields, any combination of Nishiwaki, Shei, and Turner would destroy the specific and intended teachings of Nishiwaki to quickly and accurately produce *multiple nozzles* in a nozzle plate *at*

the same time. This is because, if one were to modify the Nishiwaki process according to the teachings of either Turner or a combination of Shei and Turner, the multiple beam and multiple nozzle forming process and the intended manufacturing speed and accuracy in Nishiwaki would be eliminated. As stated before, both Turner and Shei teach formation of only a single beam to create only either a single hole (Turner) or a single work area (Shei).

Thus, any combination of Turner and Shei with Nishiwaki would destroy the teachings of Nishiwaki. The purported alternate combinations of these references are improper as a result. The rejection of the independent claims should be withdrawn at least for this reason.

As further support for this position, the applicants had provided an affidavit of one of the inventors, Stephen Temple. Mr. Temple notes at paragraphs 9, 10, and 16 that both Turner and Shei teach utilizing only a single beam, which can create no more than one hole at a time. The affidavit of Mr. Temple bolsters the fact that any combination of Nishiwaki with Shei and/or Turner would destroy the teachings of Nishiwaki.

3. Reference Combination Fails to Teach or Suggest All Limitations

Turner discloses a laser drilling operation for forming reverse tapered air flow nozzles in an aircraft wing. Figure 4 of Turner clearly illustrates that its optical assembly 8 is rotated about an axis 17 and that its laser beam 18 does not enter or exit the assembly 8 co-linear with the axis 17 of rotation. Instead, the beam 18, upon exiting the assembly 8, is moving completely around the axis 17 and, thus, forms the hole in the aircraft wing 9 by trepanning. In other words, the beam is not rotating about its own axis, but instead is moving in a circle parallel to and spaced from the axis 17 of rotation of the assembly 8. If one where to combine the teachings of Turner with Nishiwaki alone, or with Nishiwaki and Shei, in order to form a reverse tapered hole, the resulting combination would not result in the invention as claimed.

Each of independent claims 9, 23, and 31 specifically recites a tapered nozzle and an assembly that is rotated about an axis. The nozzle forming beam is co-linear with this axis of rotation in order to form a nozzle. Thus, in each of the claims, the beam is rotated

about the same axis as the assembly. Any combination of Turner with Nishiwaki would not result in this limitation of the claims. As a result, the combination of Turner with Nishiwaki and Shei does not teach or suggest all of the limitations of these claims. The rejection of these claims should be withdrawn for at least these reasons.

To further support this position, the earlier filed affidavit of Mr. Temple, at paragraphs 14-16, notes that Turner in fact employs a spherical lens and trepanning of a single beam to create the envelope of a reverse tapered hole. As discussed above, this is wholly contrary to the invention as claimed. The claimed invention, as Mr. Temple notes, uses a fixed beam width which is rotated about its own axis to produce time-averaged constant energy in all the beamlets issuing from the lens. Once the beamlets are reconverged, the beam does not rotate at all. Thus, the claimed nozzle formed in the nozzle plate is not formed by trepanning, but by a single focus uniform beam directed at the nozzle plate, which is quite the opposite of the beam trepanning method of Turner.

4. Shei and Turner are Non-analogous to the Claimed Invention

Any combination of Nishiwaki and Shei is improper. Further, a combination of Nishiwaki and Turner is also improper. Nishiwaki is specifically directed to a method of forming nozzles for ejecting *liquid ink* in inkjet printheads. Both Shei and Turner are from completely different fields and are non-analogous to the present invention.

Shei is specifically directed to an energy delivery system for use in laser eye surgical procedures. Nishiwaki teaches producing holes through a flat plate. Shei teaches reshaping an eyeball, which is a combination of a spherical and a cylindrical (non-flat) surface. Forming a hole in an eyeball would be completely unthinkable in laser eye surgery and would result in catastrophic injury and blindness to the patient. One looking to modify an ink jet nozzle-forming process would not think to look to a laser eye surgical procedure as taught by Shei for guidance.

Additionally, Shei describes a method for modulating the fluence in the surgical beams so as to uniformly cut or shape the non-flat, combined spherical and cylindrical surface of the eye. The primary consideration in ink jet nozzle formation is to

achieve uniformity of illumination, and thus in the energy across the beam. This again is quite the contrary to the teachings of Shei. An ink jet engineer would simply have no motivation or reason to look to the teachings of Shei in order to modify the method disclosed in Nishiwaki for forming inkjet nozzles. Mr. Temple's affidavit is clear on this point as can be seen in paragraphs 6 and 7 therein.

Similarly, Turner discloses a method of forming air flow nozzles in an aircraft wing. The nozzles are used for perforating an aircraft wing to remove a boundary layer across the wing by applying suction to the inner surface of the wing. Ejecting droplets of liquid ink from a nozzle requires completely different considerations in the characteristics of the formed nozzle to achieve precise and accurate ejection of the liquid ink. To the contrary, the Turner nozzles are only for flow of a gas, i.e., air, and are tapered to eliminate clogging at the nozzle inlet.

There would have been no motivation for one having ordinary skill in the art of ink jet to look to the air flow orifice teachings of Turner in order to modify the nozzle forming method of Nishiwaki. Turner is also from a non-analogous field of endeavor, posing completely different concerns and problems in comparison to the field of ink jet. The combination of Turner and Nishiwaki is improper.

The rejections of independent claims 9, 23, and 31 based on a combination of either Nishiwaki, Shei, and Turner should be withdrawn in accordance with all of the foregoing reasons. The corresponding dependent claim 24 should be allowable as depending from an allowable base claim.

D. The Rejection of Claims 9, 23, 24, and 31 Over Nishiwaki and Turner Should be Withdrawn

The examiner has raised an alternative rejection of claims 9, 23, 24, and 31 removing the Shei reference. This rejection is based on the primary reference Nishiwaki as modified by the teachings of only Turner. This alternative rejection is improper for a number of reasons. Each of the reasons is discussed separately below.

1. No Motivation or Suggestion to Combine the References in the Manner Applied

At page 6 and 7 of the action, the examiner again notes that Nishiwaki does not teach directing a laser beam to reflecting surfaces rotating as an assembly so as to invert and direct the beam in the manner claimed. The examiner alleges that Turner teaches a laser drilling process including rotating a laser beam via an optical assembly including a mirror 14 having two reflecting surfaces and an outer mirror 11 having two reflecting surfaces. For the sake of argument herein only, we do not dispute this allegation. However, to support the rejection, the examiner then merely states that because Nishiwaki teaches some of the claim limitations and Turner teaches the rest of the claim limitations,

> it would have been obvious for one of ordinary skill in the art to have provided a rotating optical assembly having a first reflecting surface and at least two additional beam reflecting surfaces that are rotating as an assembly as taught by GB 2 262 253 A in the process of Nishiwaki *et al.* ('250) because, GB 2 262 253 A teaches that such an assembly provides for reversed tapered holes, hence improving process versatility by allowing drilling of preformed surfaces in which the undersurface is not accessible.

Again, the examiner has merely stated a conclusion that the combination would have been obvious because Turner conveniently teaches forming reverse tapered holes. The reasoning is said to be to improve process versatility, which has absolutely no relevance to the claimed process. The nozzle plate of the claims is merely a plate that produces a tapered hole regardless of accessibility of either side of the plate.

The approach taken by the examiner is a classic case of hindsight reconstruction. The examiner has merely used the independent claims 9, 23, and 31 as a template to reconstruct the prior art teachings and for the suggestion to combine the reference teachings. This is wholly improper. The examiner has failed to point to or identify in the prior art the motivation or suggestion to combine Nishiwaki and Shei in the manner used to reject the claims. Instead, the examiner has merely stated the conclusion that because these two references allegedly disclose all of the claim limitations, it would therefore be obvious to

combine them. The obviousness rejection based on Nishiwaki and Turner should be withdrawn as the examiner has failed to raise a *prima facie* case of obviousness.

2. Added Reference Combination Destroys Teachings of Nishiwaki

As noted above, Nishiwaki discloses and claims the specific intent and desire to produce multiple nozzles simultaneously in order to accurately and quickly manufacture nozzle plates. Combining the teachings of Turner and Nishiwaki would destroy these express teachings of Nishiwaki. As noted above, Turner discloses forming one hole at a time using a single rotating beam. Any combination of Turner and Nishiwaki would require using only a single beam and thus a single hole at a time rendering it impossible to accurately and quickly manufacture multiple nozzles simultaneously as taught by Nishiwaki.

The rejection based on Nishiwaki and Turner should be withdrawn for at least this additional reason.

3. Combination Fails to Teach or Suggest all Limitations

Also as noted above, Turner teaches trepanning of a single beam to create an envelope of a reversed tapered hole. The beam in Turner does not rotate about its own axis that would be colinear with an axis of rotation of the beam forming assembly 8 in the reference. Instead, the beam in Turner is circled around and spaced radially outward from the axis of rotation of the assembly 8. Thus, any combination of Nishiwaki and Turner would result in a method lacking all of the limitations of the claims. Each of the independent claims of the appellants' application recites that the beam is rotated about an axis which is colinear with an axis of rotation of the beam inversion and redirecting device.

As a result and as for the same reasons set forth above with respect to the alternate rejection of claims 9, 23, 24, and 31, a combination of Nishiwaki and only Turner fails to teach or suggest all of the limitations of the claim. Thus, the examiner has failed to raise a *prima facie* case of obviousness based on this reference combination. For at least this reason, the rejection should be withdrawn.

4. Turner is Non-Analogist to the Claimed Invention

As noted above, and for the same reasons, Turner is non-analogous to the claimed invention. For at least this additional reason, this alternative rejection of claims 9, 23, 24, and 31 should be withdrawn.

E. The Rejections of Claim 25 Should be Withdrawn

Claim 25 has been rejected as obvious over two different reference combinations, one being Nishiwaki in view of Shei, Turner, and Daly, and the other being Nishiwaki in view of only Turner and Daly. Essentially, claim 25 is rejected for the same reasons that its base claim 23 was rejected and further in view of Daly. Daly fails to teach or suggest any of the missing claim limitations notes above with respect to Turner. Further, Daly fails to provide the necessary suggestion or motivation, or to remedy any other deficiency, in making the primary reference combinations of Nishiwaki, Shei and Turner or Nishiwaki and Turner.

Further, the examiner has not alleged such teaching in Daly. Daly has only been cited by the examiner as teaching a missing limitation found only in claim 25 of use of high reflectance dye electric mirrors. For the purposes of this opinion only, this is not disputed by the appellants. Instead, claim 25 is not rendered obvious for the same reasons set forth above with respect to its base claim 23. For the same reasons discussed above with respect to claim 23, the rejection of claim 25 should be withdrawn. The examiner has failed to state a *prima facie* case of obviousness.

F. Rejections of Claim 35 Should be Withdrawn

Claim 35 has been rejected as obvious over two different reference combinations including Nishiwaki in view of Shei, Turner, and Hizny, as well as Nishiwaki in view of only Turner and Hizny. Claim 35 depends directly from independent claim 9. Claim 34 is rejected over the same two reference combinations as base claim 9, but each further in view of the teachings of Hizny. Hizny fails to teach or suggest the missing claim limitations noted above with respect to the rejections based on Turner and also fails to provide the missing motivation or suggestion, as well as remedy any other deficiency, in

combining the teachings of Nishiwaki, Shei, and/or Turner. Further, the examiner has not applied Hizny for such teachings. Instead, Hizny is only cited for its teaching of use of spatial filter masks recited in claim 35. For at least the same reasons that base claim 9 is not rendered obvious by either of the two rejections, claim 35 is not rendered obvious over either reference combination. The two rejections of claim 35 should be withdrawn. The examiner has failed to establish a *prima facie* case of obviousness with respect to base claim 9 and, thus, with respect to dependent claim 35.

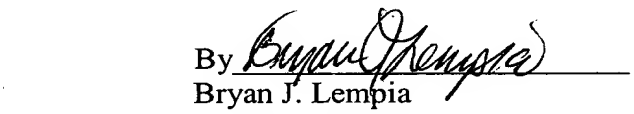
In view of all of the foregoing reasons, all of the claim rejections should be withdrawn. The application should pass to issuance with claims 9, 23-25, 31, and 34-37.

VIII. CLAIMS

A copy of the claims involved in the present appeal is attached hereto as Appendix A. As indicated above and below, the claims in Appendix A include the last amendments filed by the appellant on October 15, 2004, but do not include the proposed amendments to the claims in the paper submitted with this Appeal Brief.

Dated: June 9, 2005

Respectfully submitted,

By 

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VIII. CLAIMS - APPENDIX A

Claims Involved in the Appeal of Application Serial No. 09/754,486

The listing of the claims below are as last amended on October 15, 2004. The claims listed below ***do not*** include the proposed amendments submitted herewith.

1-8. (Canceled)

9. (Previously Presented) Method of forming a nozzle in a nozzle plate for an ink jet printhead, the nozzle having a nozzle inlet and a nozzle outlet in respective opposite faces of said nozzle plate, the method comprising the steps of:

directing a high energy beam towards said nozzle plate; introducing divergence into said beam; thereafter directing said beam at a single aperture of a mask, thereby to shape said beam; thereafter passing said beam through beam converging means, and subsequently directing said beam at said substrate such that said beam first impinges upon the face of said nozzle plate in which said nozzle outlet is formed, thereby to form a nozzle, the nozzle outlet being conjugate through said beam converging means with said single aperture;

wherein the step of introducing divergence into said beam comprises splitting said beam into a number of sub-beams, each sub-beam having divergence, the origin of divergence of each sub-beam lying apart from the point at which the respective sub-beam is created by splitting; thereafter passing the sub-beams through further beam converging means prior to recombining and directing the sub-beams through said single aperture of a said mask, wherein dimensions of a section of said recombined beam directly prior to impinging a plane of said mask are substantially equal to dimensions of said single aperture of said mask; and,

wherein said high energy beam is directed at a first planar reflecting surface lying at an angle to said first direction, said first surface being arranged so as to reflect said beam toward-at least two additional beam reflecting surfaces so arranged as to both invert said beam and direct said beam along an axis colinear with said first axis extending in a first direction; said first planar reflecting surface and said at least two additional beam reflecting surfaces being fixed relative to one another, thereby to form an assembly, and rotating said

assembly about said first axis, said beam thereafter impinging on said nozzle plate, thereby to form said nozzle wherein said nozzle inlet is larger in diameter than said nozzle outlet.

10-22. (Canceled)

23. (Previously Presented) Method of forming a nozzle in a nozzle plate for an ink jet printhead, the nozzle having a nozzle inlet and a nozzle outlet in respective opposite faces of said nozzle plate, the method comprising the steps of:

directing a high energy beam having a first axis extending in a first direction towards said nozzle plate; directing said beam at a first reflecting surface lying at an angle to said first direction, said surface being arranged so as to reflect said beam towards a second reflecting surface and a third reflecting surface so arranged as to both invert said beam and direct said beam along an axis colinear with said first axis extending in a first direction; said first, second, and third surfaces being fixedly located relative to one another, thereby to form an assembly, and rotating said assembly about said first axis; said beam thereafter being directed at and first impinging on a face of said nozzle plate in which said nozzle outlet is formed, thereby to form ~~a~~ said nozzle wherein said nozzle inlet is larger in diameter than said nozzle outlet.

24. (Original) Method according to claim 23 wherein the reflecting surfaces each comprises a discrete member.

25. (Original) Method according to claim 24, wherein said discrete member is a high reflectance dielectric mirror.

26-30. (Canceled)

31. (Previously Presented) A system for forming a nozzle in a nozzle plate for an ink jet printhead, said system comprising a nozzle plate substrate, and assembly, and a source of a high energy beam having a first axis extending in a first direction; wherein the assembly comprises a first reflecting surface lying at an angle to said first direction, a second reflecting surface, and a third reflecting surface, said first, second, and third reflecting surfaces being fixedly located relative to one another such that said high energy beam is reflected by said first reflecting surface towards said second reflecting surface and said third reflecting surface, thereby to both invert said beam and direct said beam along a second axis colinear with said first axis extending in the first direction; said assembly being rotatable about said first axis, and said nozzle plate substrate being partly disposed within a path defined by said second axis and arranged such that said beam is directed at and first impinges upon a face of said nozzle plate substrate in which a nozzle outlet is formed, and wherein said nozzle outlet is smaller in size than a nozzle inlet formed in an opposite face of said nozzle plate substrate.

32-33. (Canceled)

34. (Previously Presented) Method according to claim 9, wherein the power of said high energy beam is initially held low and is increased with increasing depth of the nozzle formed in said nozzle plate.

35. (Previously Presented) Method according to claim 9, wherein a further mask is interposed between the mask and the bèam converging means.

36. (New) Method of forming a nozzle in a nozzle plate for an ink jet printhead, the nozzle having a nozzle inlet and a nozzle outlet in respective opposite faces of said nozzle plate, the method comprising the steps of:

directing a high energy beam towards said nozzle plate; introducing divergence into said beam; thereafter directing said beam at a single aperture of a mask, thereby to shape said

beam; thereafter passing said beam through beam converging means, and subsequently directing said beam at said substrate such that said beam first impinges upon the face of said nozzle plate in which said nozzle outlet is formed, thereby to form a nozzle, the nozzle outlet being conjugate through said beam converging means with said single aperture;

wherein the step of introducing divergence into said beam comprises splitting said beam into a number of sub-beams, each sub-beam having divergence, the origin of divergence of each sub-beam lying apart from the point at which the respective sub-beam is created by splitting; thereafter passing the sub-beams through further beam converging means prior to recombining and directing the sub-beams through said single aperture of a said mask, wherein dimensions of a section of said recombined beam directly prior to impinging a plane of said mask are substantially equal to dimensions of said single aperture of said mask;

wherein said high energy beam is directed at a first planar reflecting surface lying at an angle to said first direction, said first surface being arranged so as to reflect said beam toward a second beam reflecting surface and a third beam reflecting surface so arranged as to both invert said beam and direct said beam along an axis colinear with said first axis extending in a first direction; said first planar reflecting surface and said second and third beam reflecting surfaces being fixed relative to one another, thereby to form an assembly, and rotating said assembly about said first axis, said beam thereafter impinging on said nozzle plate, thereby to form said nozzle wherein said nozzle inlet is larger in diameter than said nozzle outlet; and,

wherein the power of said high energy beam is initially held low and is increased with increasing depth of the nozzle formed in said nozzle plate.

37. (New) Method according to claim 36, wherein a further mask is interposed between the mask and the beam converging means.